Attachment B

Supplemental Model Simulation Results

The results from a series of model sensitivity simulations using ambient flow without gravity-enhanced flow at the Richton north site are presented in this Attachment. The model was run to simulate the movement of the brine plume under both summer and winter current conditions. The results are presented as a time series of the area covered by the excess 1 through 10 practical salinity units (psu) salinity concentration contours of the brine plume. A series of maps showing a plan view snapshot of the brine plume excess salinity contours between 1 and 10 psu are also shown. The snapshots were selected to show the excursion of the brine discharge plume as it moves in response to tidal currents as well as wind-induced flow. Model simulations were run for the length of time simulated by the CH3D hydrodynamic model – 5 months in the summer season and 1 month in the winter.

Figure B-1 shows a time series of the area covered by the excess salinity at the Richton north site during summer and winter simulation periods. Except for +1 and +2 psu contours, the areas reach a quasi steady state after early June (i.e., 6-8 weeks into the simulation). The mean area covered by the predicted excess salinity contours for the 1 through 10 psu concentrations is listed in Table B1.

Table B1. Mean area covered by excess salinity contours predicted by the far-field model using ambient flow without gravity flow.

Excess Salinity (psu)	Mean Area Covered (km^2)	Mean Area Covered (mi^2)
+1	186.5	72.0
+2	80.7	31.2
+3	40.3	15.6
+4	26.1	10.1
+5	18.0	6.9
+6	13.1	5.0
+7	10.0	3.9
+8	7.8	3.0
+9	6.2	2.4
+10	5.03	1.9

Figures B-2 to B-7 show maps of the brine plume for a snapshot in time in the middle of each month simulated. Using the 1 psu contour to define the largest footprint, the brine plumes from the Richton north site are predicted to be elongate in shape, typically 5 to 10 kilometers (3.1 to 6.2 miles) wide and up to 35 kilometers (21.7 miles) long. The major direction of the plume aligns along an east-west axis for most of the simulation period, generally parallel to the along-shore wind component. This dominance of the east-west direction implies that net dispersion of the brine plume is mainly controlled by low frequency along-shore wind-induced flow rather than tidal currents which are mainly north-south directed in this area.

Figure B-4 shows that during mid-July the brine plume was dispersed toward the west, as seen in the footprint of the +1 and +2 psu contours. This extended area of the brine plume was predicted to increase continuously toward the west for several weeks, reaching a maximum extent in mid-August (Figures B-1 and B-5). The remaining portion of this extended plume still exists in the western region even after a couple of months (Figure B-6). The persistence of the brine plume at the +1 and +2 psu concentrations is likely caused by a relatively low vertical diffusion coefficient used in the model simulations. The diffusion coefficient was estimated by a formula using the gradient Richardson number in order to incorporate the stratification present in the water column. The small magnitude of the vertical diffusion coefficient is appropriate for a conservative approach as it reduces the dilution of the discharged brine solution and increases discharge persistence.

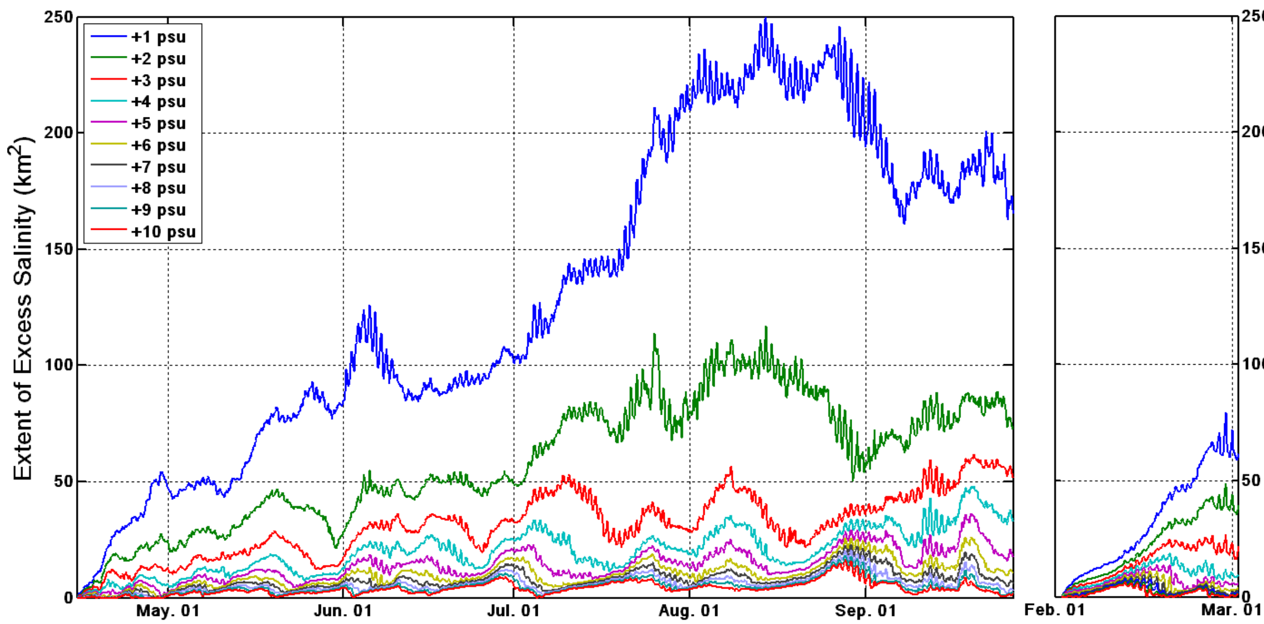

Figure B-1. Variability of the area enclosed by contours of excess salinity of 1 to 10 psu from the far field model simulation with ambient flow and no gravity at the Richton north discharge site. Data from the summer five month and winter one month periods are shown.

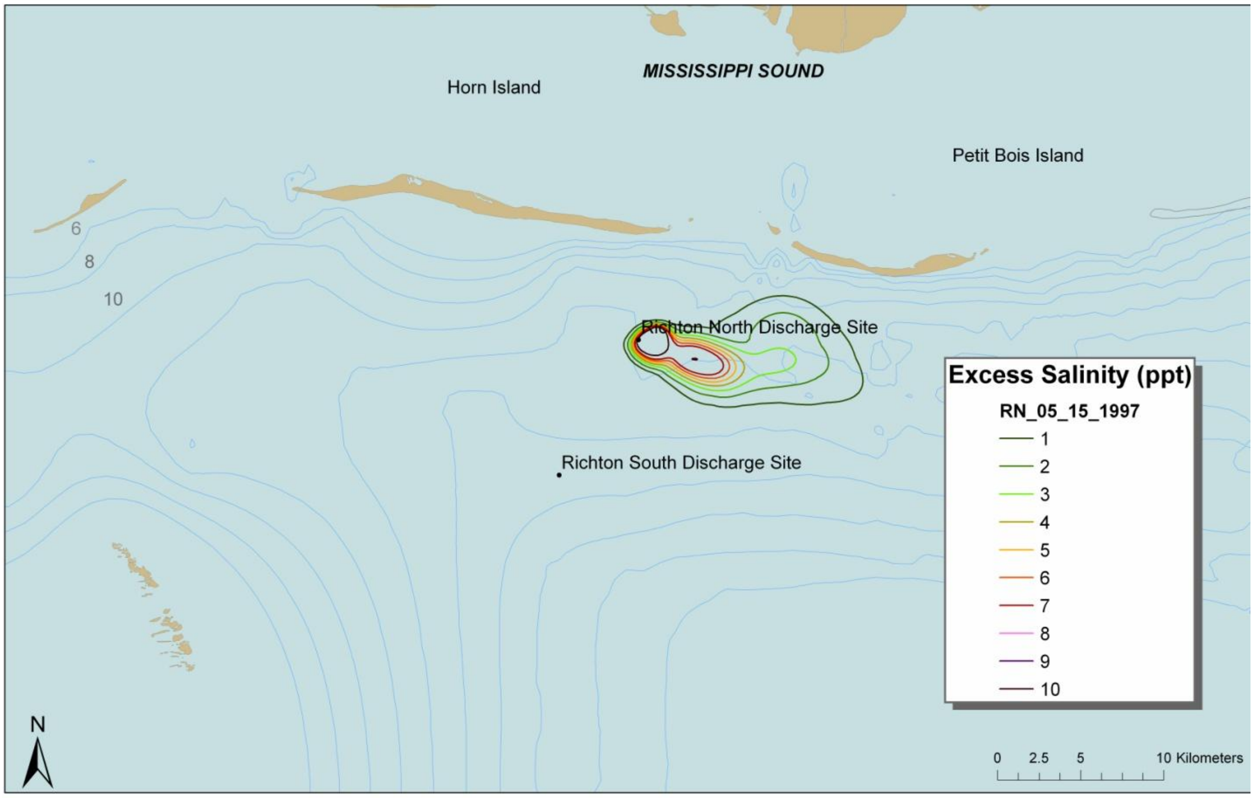

Figure B-2. Model predicted excess salinity of the brine discharge plume from the north discharge site during May 1997. Contours enclose areas of excess salinity.

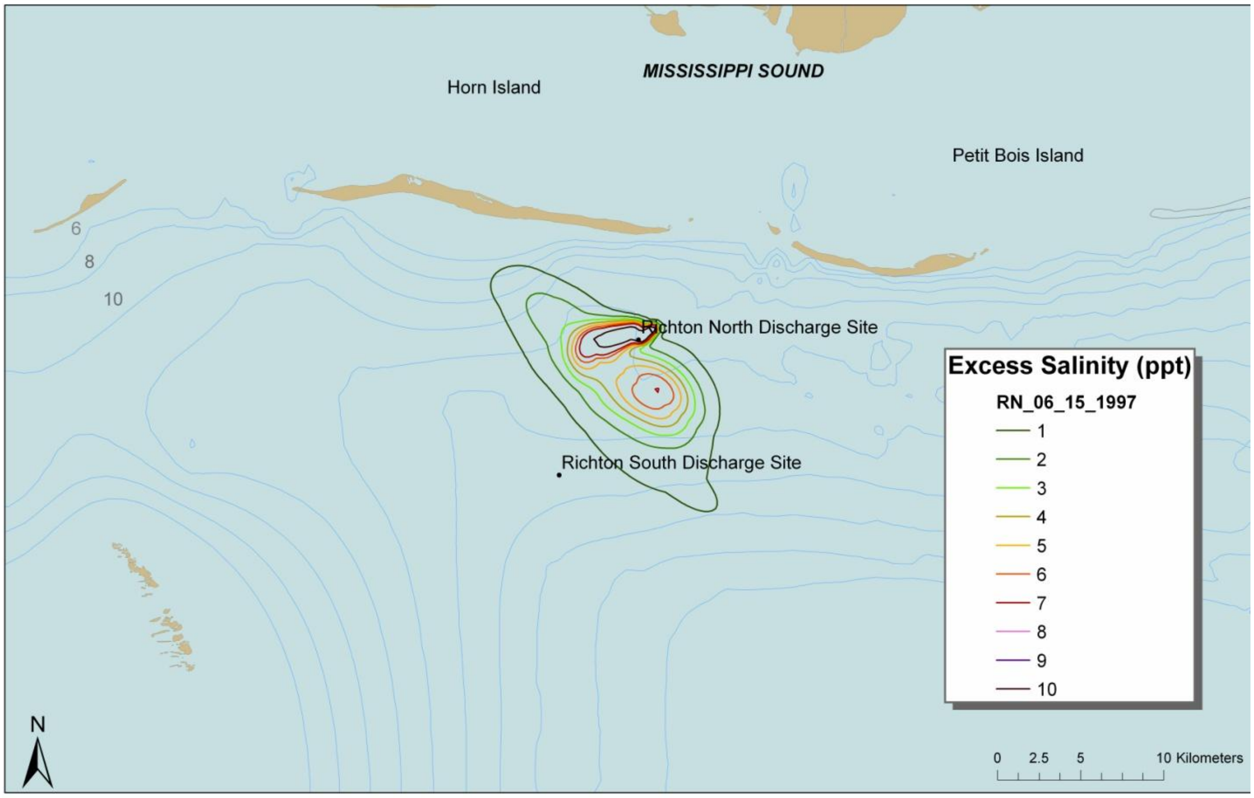

Figure B-3. Model predicted excess salinity of the brine discharge plume from the north discharge site during June 1997. Contours enclose areas of excess salinity.

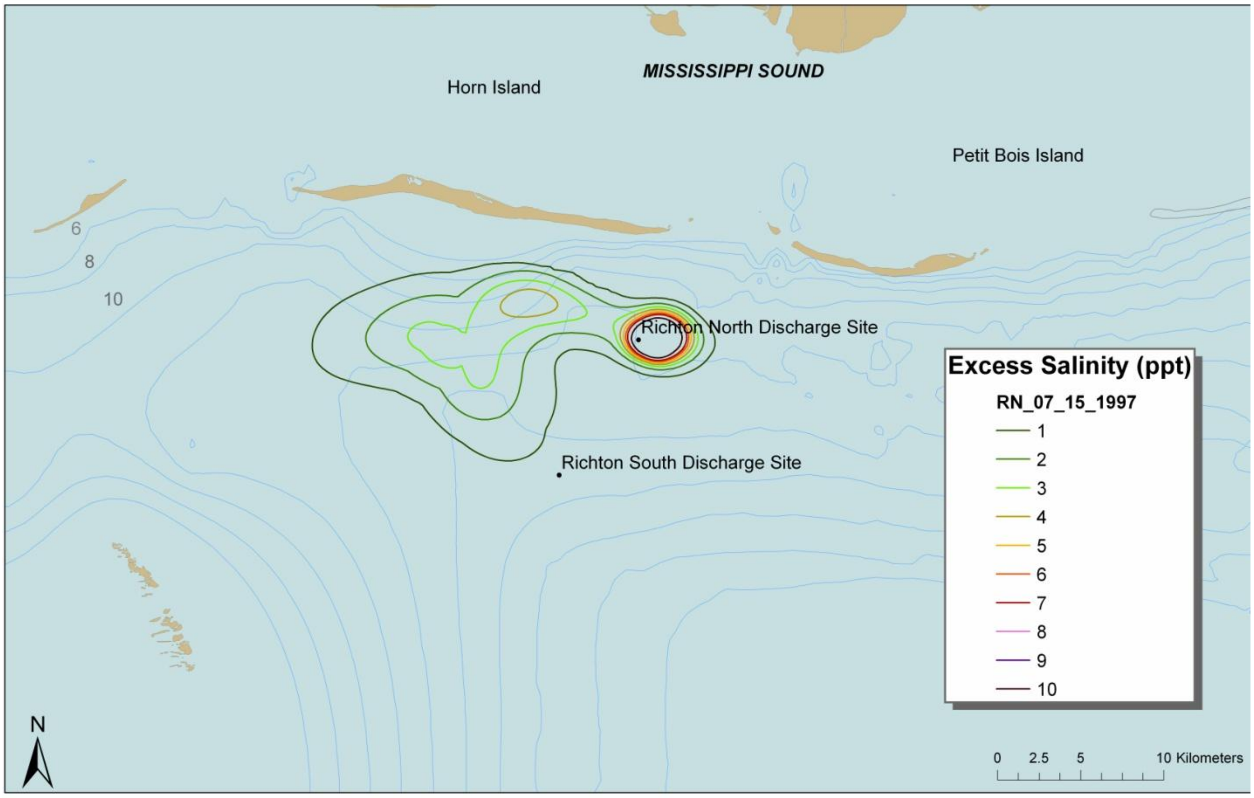

Figure B-4. Model predicted excess salinity of the brine discharge plume from the north discharge site during July 1997. Contours enclose areas of excess salinity.

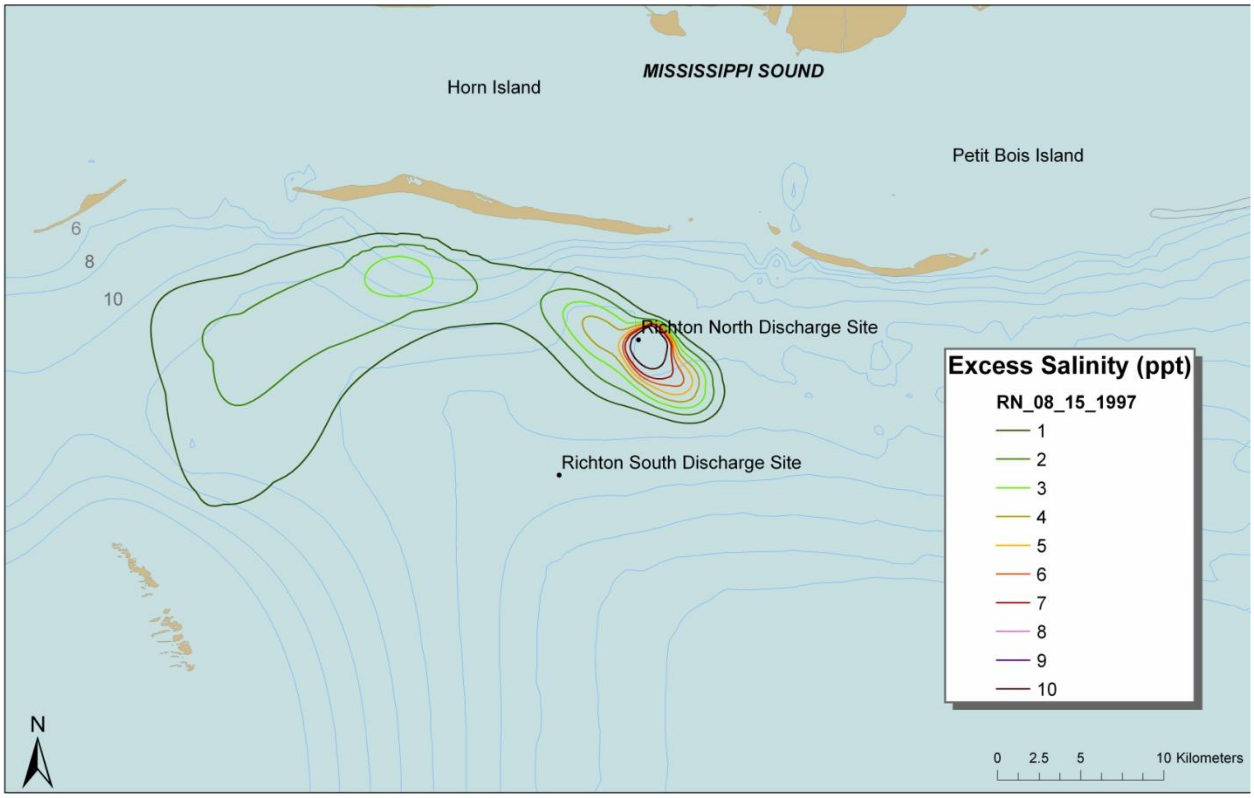

Figure B-5. Model predicted excess salinity of the brine discharge plume from the north discharge site during August 1997. Contours enclose areas of excess salinity.

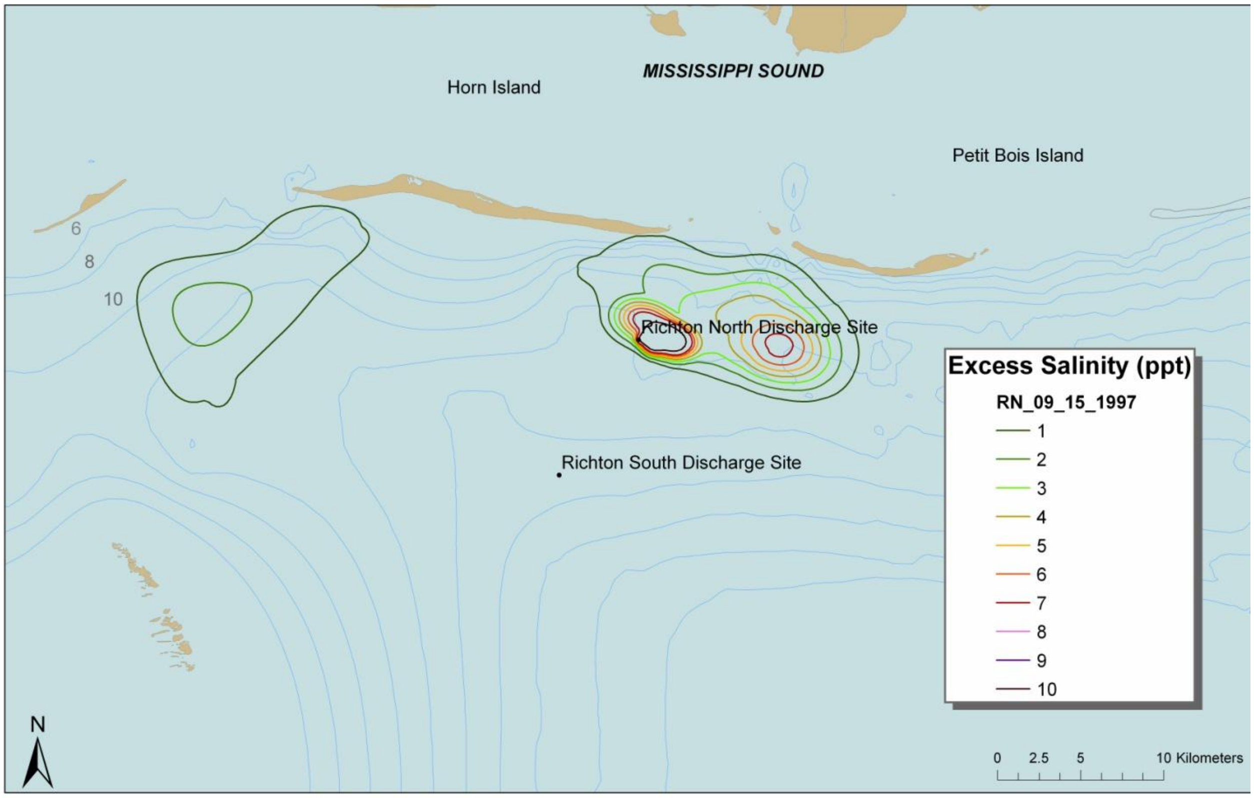

Figure B-6. Model predicted excess salinity of the brine discharge plume from the north discharge site during September 1997. Contours enclose areas of excess salinity.

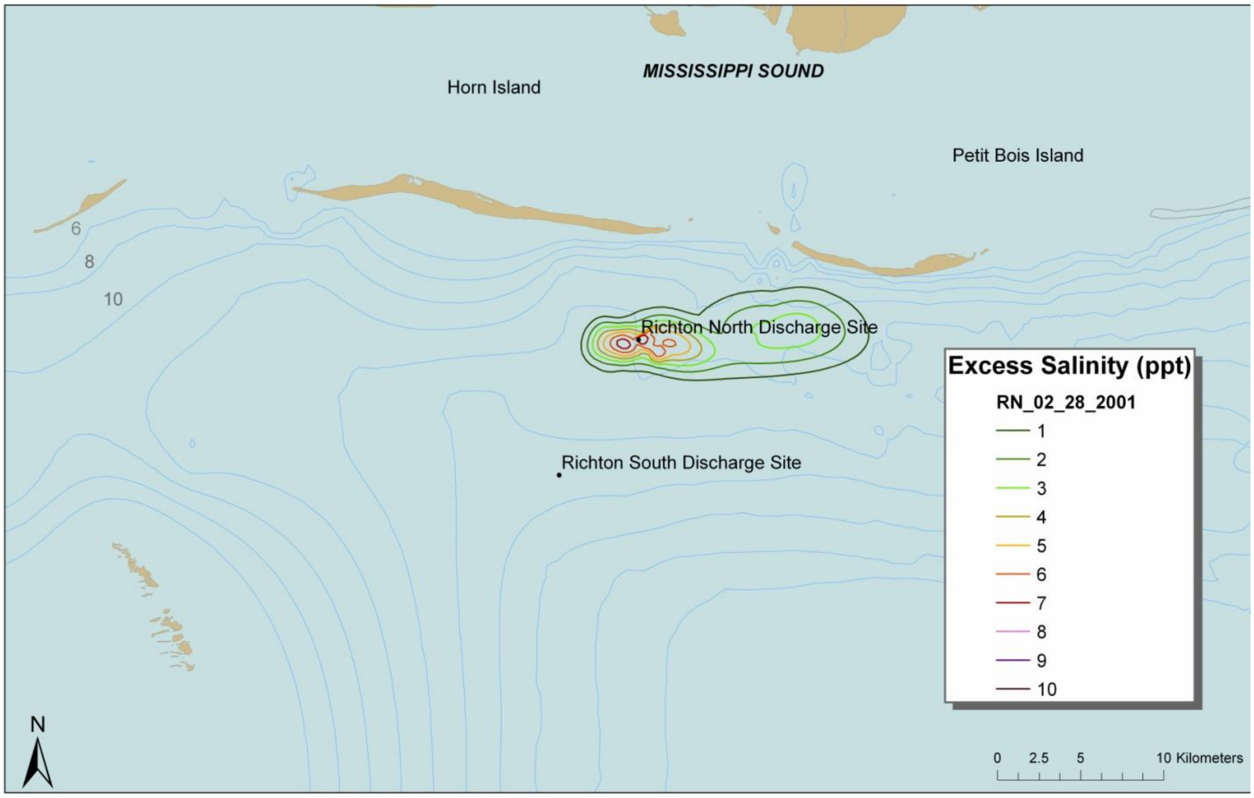

Figure B-7. Model predicted excess salinity of the brine discharge plume from the north discharge site during February 2001. Contours enclose areas of excess salinity.